Michigan Department of Licensing and Regulatory Affairs

Dosimetry for Analytical and Industrial Radiographic X-ray Machines

Radiation Safety Section

Type of Machine	Policy	Rationale
Closed-beam analytical x-ray equipment, such as x-ray fluorescence units. These units have to be closed-beam by manufacturer's design.	Facilities will not be cited for a violation of Rule 487 if dosimeters are not provided.	Our survey experiences with closed-beam analytical units, such as x-ray fluorescence equipment, have shown the radiation levels to be very low, even non-detectable, at the outside surfaces. Such manufacturer-designed, closed-beam units are more positively tamper-proof during use and do not allow the operator to bring their hands near the primary beam, so finger or wrist dosimeters may not be appropriate.
Open-beam analytical x-ray equipment, such as x-ray diffraction units. Equipment protected by an interlocked cover added to prevent unintentional exposure of part of a person's body to the primary beam is considered open-beam.	A finger or wrist dosimeter is required by Rule 487.	Open-beam analytical x-ray systems allow a user to place some part of his or her body in the primary beam path during normal operation. Open-beam analytic units that are provided with interlocked enclosures are often intentionally defeated by operators for the purpose of aligning the apparatus. Thus, the potential for exposure to the hands is real, and dosimeters must be provided.
Class AA industrial radiographic cabinet x-ray systems of insufficient size to permit human occupancy. Class AA industrial cabinet x-ray systems include machines designed for inspection of carry-on baggage at airline, railroad, and bus terminals or similar systems used for security inspections.	A dosimeter is not required.	Rule 294(12) requires cabinet x-ray systems of insufficient size to permit human occupancy to be constructed such that the radiation exposure rate at a distance of 5 cm from any accessible surface does not exceed 0.5 mR per hour. Operators of these systems are not likely to receive a dose in excess of 25% of the quarterly occupational limit.
Class AA industrial radiograpic installation of sufficient size to permit human occupancy	A dosimeter is required by Rule 222.	Class AA installations of sufficient size to permit human occupancy are allowed an external exposure rate of up to 2 mR per hour at 5 cm from any accessible surface. At this rate, operators could receive a dose in excess of 25% of the quarterly occupational limit.

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Class A, B, or C industrial radiographic installations.	A dosimeter is required by Rule 296.	Permitted radiation exposure levels outside of these installations are higher than for class AA installations.
Class D industrial radiographic operations.	Both a long-term dosimeter and a short-term dosimeter (such as a pocket dosimeter) are required by Rules 299 (6) and 303 (1).	Class D operations are done outside of a permanent shielded enclosure.